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REDESCRIPTION OF THE SHRIMP BATHYPALAEMONELLA PANDALOIDES (RATHBUN), WITH REMARKS ON THE FAMILY CAMPYLONOTIDAE

By L. B. Holthuis

In a paper on brachyuran and macruran decapod Crustacea from the Hawaiian Archipelago, Rathbun (1906) described a new species of shrimp under the name *Palaemon pandaloides*. Kemp (1925) in his key to the species of the genus *Palaemon* (to which he gave the name *Leander*) inserted Rathbun's species under the name *Leander pandaloides* without having access to specimens. Since then the species has not been recorded in the literature.

While working last year in the United States National Museum I had the opportunity, through the courtesy of Dr. Fenner A. Chace, Jr., curator of the division of marine invertebrates, of reexamining the type specimens of *Palaemon pandaloides* and found that they do not belong to the genus *Palaemon* at all, as indicated by the presence of arthrobranchs at the bases of the pereiopods. They undoubtedly belong to the family Campylonotidae. Comparison of the specimens with Balss's (1925) description of the genus *Bathypalaemonella* made it clear that *Palaemon pandaloides* belongs in that genus. Rathbun's specimens differ, however, in some respects from Balss's *Bathypalaemonella zimmeri* and so have to be considered to belong to a separate species.

Inasmuch as Rathbun's description is rather short, it is thought that a redescription of this interesting species will be found useful.

Genus BATHYPALAEMONELLA Balss

BATHYPALAEMONELLA PANDALOIDES (Rathbun)

FIGURE 43

Palaemon pandaloides RATHBUN, Bull. U. S. Fish Comm., vol. 23, pt. 3, p. 924, fig. 73, pl. 22, fig. 4, 1906.
Leander pandaloides KEMP, Rec. Indian Mus., vol. 27, p. 290, 1925.

Description.—The rostrum is very long and slender, overreaching the scaphocerite with a large part of its length. The upper margin bears 17 teeth in the proximal half, the distal portion entire except for a subapical tooth. Five or six dorsal teeth of the rostrum are placed on the carapace behind the orbit. The proximal dorsal teeth of the rostrum are shorter and more erect than the distal teeth, which are longer, slenderer, and pressed against the rostrum proper. The lower margin bears 13 teeth, the distals of which are far more widely spaced than the proximals. The carapace is smooth and possesses antennal and branchiostegal spines. The antennal spine is placed slightly below the rounded orbital angle. The branchiostegal spine is situated on the anterior margin of the carapace, just like the antennal. No branchiostegal groove is present. The anterolateral angle of the carapace is rounded.

The abdomen is smooth and has the pleurae of the first five segments broadly rounded. The sixth segment is slightly more than twice as long as the fifth and somewhat shorter than the telson. The telson is elongate and provided with two dorsal pairs of spines, which are placed in the middle and at three-quarters of the length of the telson. The posterior margin of the telson is truncate; it is provided with four pairs of spinules, the outer of which are short, the three inner pairs longer and of equal length.

The eyes are well developed; the cornea is rounded and provided with black pigment.

The antennular peduncle has the stylocerite large and sharply pointed. Slightly above its base the stylocerite is somewhat broadened, and it reaches almost to the middle of the second segment of the peduncle. No anterolateral spine is present at the basal segment of the peduncle. The second segment is somewhat longer than the third. The upper antennular flagellum is slightly thickened at the base and consists of a single ramus.

The scaphocerite is long and slender, almost six times as long as broad. The outer margin is concave. The final tooth is strong and reaches about as far forward as the lamella. The antennal peduncle fails to reach the middle of the scaphocerite. A distinct spine is present near the external side of the base of the scaphocerite.

The oral parts strongly resemble those of *Bathypalaemonella zimmeri* Balss. The incisor and molar processes of the mandible are

fused to one large denticulate plate; a 2-jointed palp is present. The maxillula, maxilla, and first maxilliped do not differ from the figures given by Balss (1925) of those parts of *B. zimmeri*. The second maxilliped has the last joint more slender and more curved than in Balss's species; an epipod and a very large podobranch are present.

The branchial formula runs as follows:

	Maxillipeds			Pereiopods				
	I	II	III	I	II	III	IV	V
Pleurobranchs				1	1	1	1	1
Arthrobranchs			1	1	1	1	1	
Podobranchs		1						
Epipods	1	1	1					
Exopods	1	1	1					

The first pereiopod is slender and reaches beyond the end of the antennal peduncle, but it fails to reach the end of the scaphocerite. The fingers are short, measuring slightly less than half the length of the palm. The chela is narrow and cylindrical. The carpus is 1.4 times as long as the chela and 1⅓ times as long as the merus. The ischium is almost as long as the merus. Only one of the second legs is present in the specimens at hand. This leg resembles the first leg, but is longer and slightly stronger. It reaches beyond the scaphocerite. The palm is narrow and cylindrical, 1.7 times as long as the fingers. The carpus is twice as long as the chela and somewhat longer than the merus, which is 1.3 times as long as the ischium. Since in *Bathypalaemonella zimmeri* the second legs are very unequal in shape and strength, it is to be expected that the same is true for the present species. However, since only one leg is present here nothing can be stated with certainty in that respect. The third leg reaches with part of the propodus beyond the scaphocerite. The dactylus is strongly curved and bears on each lateral surface a posteriorly directed spinule near the middle of the posterior margin. The propodus is more than five times as long as the dactylus; it bears some spinules in the distal part of the posterior margin, and many hairs are present there too. The carpus is about as long as the propodus. The merus is almost 1.5 times as long as the carpus; it possesses a large movable spine in the distal part. The ischium is half as long as the merus. The fourth and fifth legs are similar to the third.

The first pleopod of the male has the endopod large and oval in shape. A large part of the inner margin of the endopod is membranaceous and at the inner side provided with minute, strongly curved hooks, thus taking the place of an appendix interna. The second pleopod of the male has the appendix interna and masculina of about the same size.

The uropods are elongate and overreach the telson. The endopod is narrowly ovate. The exopod has the outer margin about straight and ending in a strong tooth, which at its inner side bears a movable spine. No other spinules are present on the exopod.

The male specimen examined by me measures 55 mm., the female 56 mm.

Locality.—The two specimens were collected near Mokuaeae Islet near Kauai Island, Hawaiian Archipelago, 950 meters, bottom fine gray sand and mud, June 12, 1902, *Albatross* station 3992.

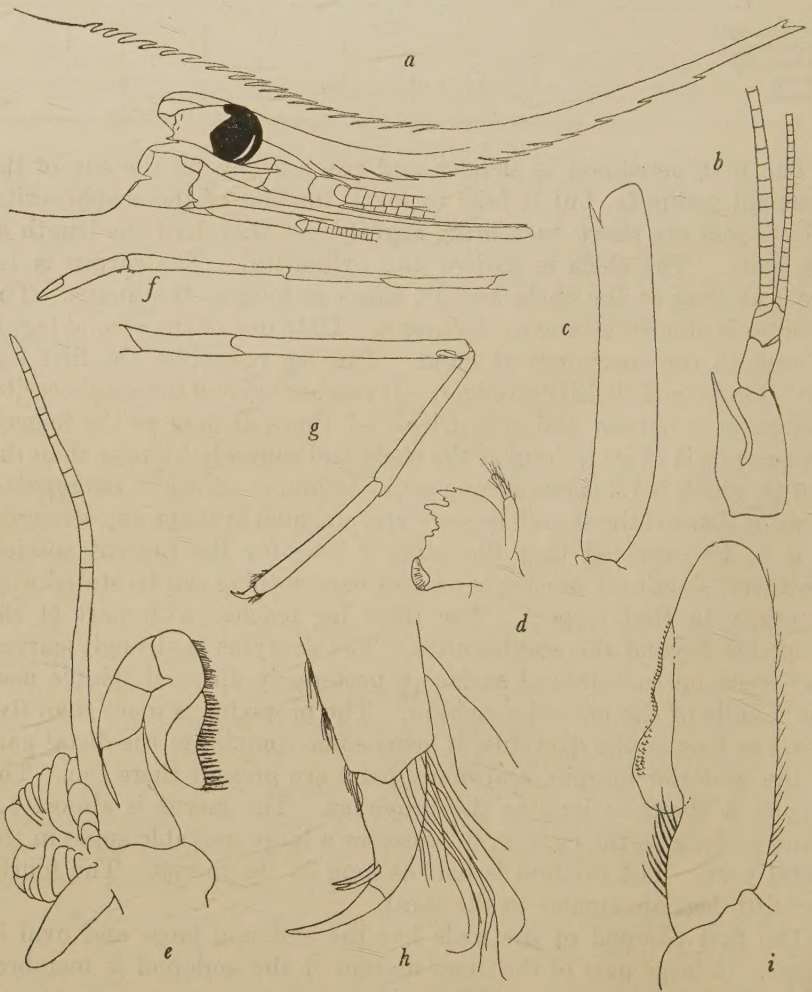

FIGURE 43.—*Bathypalaemonella pandaloides* (Rathbun): *a*, Anterior part of body in lateral view; *b*, antennula; *c*, scaphocerite; *d*, mandible; *e*, second maxilliped; *f*, first pereiopod; *g*, third pereiopod; *h*, dactylus of third pereiopod; *i*, endopod of first pleopod of male. (*a–c*, *f*, *g*, × 5; *d*, × 20; *e*, × 13; *h*, × 40; *i*, × 18.)

Remarks.—The present form is the second species known of the genus *Bathypalaemonella* Balss. It is closely related to *B. zimmeri* Balss but differs from that species in the following respects:

1. The rostrum bears many more teeth. In *B. zimmeri* the rostral formula is $\frac{3)12+1}{10}$. This formula in *B. pandaloides* is $\frac{5-6)17+1}{13}$. Though Balss in his description states that only three teeth of the dorsal margin of the rostrum are placed behind the orbit, his figure shows five there.

2. The scaphocerite in *B. zimmeri* has the anterior inner angle more produced than in *B. pandaloides*.

3. The last joint of the second maxilliped is slenderer in Rathbun's than in Balss's species.

4. The dactylus of the last three pereiopods are quite differently built in the two species. In *B. zimmeri* the dactylus is stated to be provided with four or five small denticles at the posterior margin, while in *B. pandaloides* only two denticles are present, which are very curiously placed at the same level, one at each side of the posterior margin of the dactylus.

Unfortunately, both specimens of *B. pandaloides* lack the larger second leg, so that nothing can be said about possible differences in the shape of that appendage in the two species.

Bathypalaemonella zimmeri Balss is known only from the original record, off the east coast of Somaliland, latitude 6° 18′ N., longitude 49° 32′ E., from a depth of 1,079 meters.

In 1925 Balss correctly placed the genus in the family Campylonotidae, after having put it in the family Palaemonidae in 1914. There is no doubt that *Bathypalaemonella* is a campylonotid, but I do not agree with Balss (1925, 1927) and Sollaud (1910, 1913) that this family belongs to the superfamily Oplophoroida Borradaile. Sollaud (1910, 1913) mentions the following points in favor of placing *Campylonotus* in the Oplophoroida:

1. The number of spinules on the dorsal surface of the telson is 8 or 10; in the Palaemonidae this number always should be 4.
2. The upper antennular flagellum is not bifurcated as it is in the Palaemonidae.
3. The mandible is not cleft.
4. The maxillulae have two laciniae, which both are cleft.
5. The palp of the first maxilliped is bi- or tri-articulated.
6. The exopod of the third maxilliped is jointed.
7. The second maxilliped consists of five joints.
8. Arthrobranchs are present on the first four pereiopods.
9. Epipods are present at the base of the first four pereiopods.

That the character of the number of dorsal spinules is of no importance is shown by the fact that in some Pontoniinae there are eight dorsal spinules on the telson (*Periclimenes alcocki* Kemp), while in an

undescribed species of *Pontonia* I found 10 dorsal spinules there. Balss (1925) states the mandible of his *Bathypalaemonella zimmeri* to be distinctly cleft, though the two processes are placed close together. The lower lacinia of the maxilla in the species of *Bathypalaemonella* is strongly reduced, forming thereby a transition between the situation as it is in the Palaemonidae and that in *Campylonotus*. In some species of Palaemonidae a 5-articulated endopod of the second maxilliped may be observed. As to points 2, 8, and 9 above, in the Hippolytidae genera are found that have a bifurcated upper antennular flagellum (e. g., *Lysmata*) and some that are very closely related and have the flagellum single (e. g., *Hippolysmata*); there are also Hippolytidae with arthrobranchs (e. g., *Ligur*) and others (e. g., *Barbouria*) that lack them, but nevertheless are closely related. In some genera of Hippolytidae some species have and others miss epipods on the pereiopods. In none of the Palaemonidae I examined, however, did I find the palp of the first maxilliped or the exopod of the third maxilliped articulated.

The arguments for a close relationship between the Campylonotidae and the Palaemonidae are the following:

1. The shape of the rostrum in *Campylonotus* (and in a lesser degree also in *Bathypalaemonella*) is distinctly palaemonoid.
2. The first maxilliped has the exopod resembling that of the Palaemonidae and is strongly different from that of the Oplophoridae.
3. The last joint of the second maxilliped is inserted alongside the penultimate joint and not at the top of it.
4. None of the pereiopods bears an exopod.
5. The second legs are much stronger than the first.

Especially the last argument seems very strong in my opinion, as the shape and the relationship of the first and second pairs of pereiopods are of much importance in all the higher groups of Caridea. The character of the presence or absence of exopods is rather variable in the family Atyidae, which belongs to the Oplophoroida.

In my opinion it is much more reasonable to place the family Campylonotidae in the superfamily Palaemonoida. It then should have to be considered a primitive family in that group.

This superfamily Palaemonoida must be restricted to the families Campylonotidae, Palaemonidae, and Gnathophyllidae. The families Alpheidae and Hippolytidae, placed by Borradaile (1907) and Balss (1927) in the present superfamily, have to be removed to a separate superfamily. The Palaemonoida then may be defined as: Caridea with the second legs distinctly stronger than the first, with the carpus of the second legs not articulate, without exopods on the pereiopods, with perfect chelae on the first pereiopods, and with the rostrum immovable.

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